

WHAT IS CLAIMED IS:

1. An isolated, biologically active CENP-E protein, wherein the CENP-E protein has the following properties: (i) at least one activity selected from the group consisting of plus end-directed microtubule motor activity, ATPase activity, and microtubule binding activity; and (ii) the ability to specifically bind to polyclonal antibodies generated against CENP-E.
2. An isolated protein of claim 1, wherein the protein has an amino acid sequence having at least 55% sequence identity with a *Xenopus* CENP-E (XCENP-E) motor domain of SEQ ID NO:1.
3. An isolated protein of claim 1, wherein the protein is encoded by a nucleic acid sequence having at least 70% sequence identity to SEQ ID NO:2.
4. An isolated protein of claim 1, wherein the protein is encoded by a nucleic acid that hybridizes under high stringency conditions to a nucleic acid having a sequence complementary to that of SEQ ID NO:2.
5. An isolated protein of claim 1, wherein the protein has an amino acid sequence of SEQ ID NO:1.
6. An isolated protein of claim 1, wherein the protein is from a human.
7. An isolated protein of claim 1, wherein the protein specifically binds to antibodies generated against *Xenopus* CENP-E (XCENP-E).
8. An isolated protein of claim 7, wherein the protein has an amino acid sequence having greater than 70% sequence identity with a *Xenopus* CENP-E (XCENP-E) motor domain of SEQ ID NO:1.

9. An isolated protein of claim 7, wherein the protein has an amino acid sequence of a *Xenopus* CENP-E (XCENP-E) motor domain of SEQ ID NO:1.
10. An isolated protein of claim 1, wherein the protein specifically binds to antibodies generated against a motor domain of *Xenopus* CENP-E (XCENP-E).
11. An isolated protein of claim 1, wherein the protein has an average molecular weight of about 300-350 kDa.
12. An isolated nucleic acid sequence encoding a CENP-E gene product, said sequence encoding a protein having a core motor domain that has greater than 70% amino acid sequence identity to a *Xenopus* CENP-E (XCENP-E) core motor domain as measured using a sequence comparison algorithm, and specifically binding to antibodies raised against CENP-E.
13. An isolated nucleic acid sequence of claim 12, wherein the sequence has a nucleotide sequence of SEQ ID NO:2.
14. An isolated nucleic acid sequence of claim 12, wherein the sequence comparison algorithm is PILEUP.
15. An isolated nucleic acid sequence of claim 12, wherein the sequence encodes a protein having an average molecular weight of about 300-350 kDa.
16. An antibody which specifically binds to *Xenopus* CENP-E (XCENP-E).
17. A method for identifying a candidate agent as a compound that modulates CENP-E activity, said method comprising the steps of:
 - (i) determining CENP-E activity in the presence of a candidate agent at a control concentration, wherein the CENP-E activity comprises at least one activity selected from

the group consisting of plus end-directed microtubule motor activity, ATPase activity, and microtubule binding activity; and

(ii) determining said CENP-E activity in the presence of the candidate agent at a test concentration, wherein a change in activity between the test concentration and the control concentration of said candidate agent indicates the identification of a compound that modulates CENP-E activity.

18. A method of claim 17, further comprising the step of isolating biologically active CENP-E from a cell sample.

19. A method of claim 17, wherein the biologically active CENP-E is human CENP-E.

20. A method of claim 17, wherein the biologically active CENP-E is *Xenopus* CENP-E (XCENP-E).

21. A method of claim 17, wherein the biologically active CENP-E comprises a motor domain of *Xenopus* CENP-E (XCENP-E).

22. A method of claim 17, wherein the biologically active CENP-E comprises an amino acid sequence of a XCENP-E motor domain of SEQ ID NO:1.

23. A method of claim 17, wherein said activity is plus end-directed microtubule motor activity.

24. A method of claim 17, wherein said change in activity is a decrease.

25. A method of claim 17, wherein said change in activity is an increase.

26. A method of claim 17, wherein said compound identified is a lead therapeutic compound.

27. A method of claim 26, wherein said compound is an antibody.
28. A method of claim 27, wherein said antibody specifically binds human CENP-E.
29. A method of claim 27, wherein said method further comprises modifying said antibody to be a humanized antibody.
30. A method of claim 17, wherein said compound identified is a lead bioagricultural compound.
31. A method of claim 17, wherein said compound identified is a lead diagnostic compound.
32. A method of claim 31, wherein said compound identified is an antibody.
33. A method of claim 32, wherein said antibody specifically binds to human CENP-E.
34. A method of claim 32, wherein said method further comprises modifying said antibody to be a humanized antibody.
35. A method of claim 17, wherein said method is performed in a plurality and wherein said plurality of methods are performed simultaneously.
36. A kit for screening for modulators of CENP-E, said kit comprising;
- (i) a container holding biologically active CENP-E; and
 - (ii) instructions for assaying for CENP-E activity, wherein the CENP-E activity is plus end-directed microtubule motor activity or ATPase activity.

37. A kit of claim 36, wherein the biologically active CENP-E is *Xenopus* CENP-E (XCENP-E).

38. A kit of claim 36, wherein the biologically active CENP-E is the motor domain of *Xenopus* CENP-E (XCENP-E).

39. A method of producing a biologically active CENP-E polypeptide comprising:

- (i) transforming a cell with a vector comprising the nucleic acid sequence encoding the motor domain of CENP-E;
- (ii) expressing said nucleic acid to produce a gene product;
- (iii) purifying said gene product; and
- (iv) identifying ATPase activity or plus-end directed microtubule activity of said gene product.

40. A method of moving microtubules in a plus ended direction, said method comprising contacting microtubules with CENP-E.

41. A method of claim 40, wherein said method further comprises the step of transforming a cell with a vector comprising a gene encoding said CENP-E and expressing said gene.

42. A method of claim 41, wherein said CENP-E affects proliferation of said cell.